

used to supply network-utilized services, to users poses problems.

For example, a service for supplying the contents of data, which are formed of video data, such as a motion picture, received from a provider thereof and accumulated, and supplied to plural users in accordance with the users' requests by utilizing a network will be discussed. The users' requests are concentrated on a time zone, for example, 20:00-21:00 during which many ordinary people enjoy a motion picture.

10 If a necessary amount of resources for a network for transmitting the contents of data to users are prepared in accordance with a time zone on which the users' requests for reservation are concentrated, an amount of resources which are not used in other time zones will increase, so that a general
15 resource utilization efficiency will decrease. On the other hand, if only a smaller amount of resources are prepared, the resource utilization efficiency is improved but the number of users' requests for reservation denied in a time zone on which the user's requests for reservation are concentrated will
20 increase. This will cause the degree of users' satisfaction concerning the services to lower. Especially, the utilization of the services comes to be denied at the very time at which a request for reservation is actually made, i.e., at the very time at which the users actually utilize the services.
25 Therefore, the degree of dissatisfaction concerning the

The methods of determining preferential reservations include a method of giving priority to earlier-accepted reservations, and such a method as is defined in the techniques disclosed in Japanese Patent Laid-Open No. 292987/1996, i.e.

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a method having the steps of determining the degree of importance of the reservations on the basis of the personal information on the users, and taking reservations with priority given to the reservations of higher degrees of importance.

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~~SUMMARY OF THE INVENTION:~~

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When earlier-accepted reservations are taken preferentially in a method in which reservations are taken in advance to supply services within the range of the reservations taken, later-accepted reservations of higher degrees of importance are denied in some cases. In this case, the dissatisfaction of the users the reservations of whom have been denied in spite of the high importance thereof increases.

According to the method of preferentially taking reservations of higher degrees of importance, the necessity of denying already-accepted reservations occurs so as to accept requests, which are made afterward, for reservations the degrees of importance of which are higher than those of the already-accepted reservations. In such a case, the dissatisfaction of users whose reservations once accepted have been denied increases.

In order to improve the resource utilization rate, it is necessary that the utilization of services be leveled with respect to both the time and resources. However, when the determination of the contents of the reservations of services

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to deny the acceptance of the service booking requests iff the degree of importance of the service booking requests determined by the importance degree determining element is lower than a predetermined importance degree determined by a predetermined standard, and to permit the acceptance of the service booking requests if the degree of importance of the service booking requests determined by the importance determining element is not lower than the predetermined degree, when a load level of resources used for supplying object services of the service booking requests accepted by the acceptance element and determined depending upon the reservation condition managed by the reservation condition management element is higher than a predetermined level.

The resources referred to above include resources in every meaning of the word which are used in the supplying of services, such as time resources, physical resources and logical resources.

According to the service supplying system, a predetermined load range of resources is secured for the service booking requests of a higher degree of importance. Therefore, the service booking requests of a high degree of importance can be accepted at a high probability without canceling the service booking requests of a low degree of importance after the requests have once been accepted.

According to another aspect of the present invention,

the service reservation system is provided with a reservation condition management element adapted to manage accepted reservations of services as reservation condition, a first acceptance element adapted to accept service booking requests from users, a substitute reservation plan preparation element adapted to prepare at least one substitute reservation plan, which is obtained by at least partially altering the contents of reservation in the reservation booking requests accepted by the first acceptance element, in such a manner that a general resources utilization efficiency increases, in accordance with the contents of the reservation and a load level of resources used for the supplying of the object services of the reservation booking requests, said load level being determined by the reservation condition managed by the reservation condition management element, a substitute reservation plan presentation element adapted to present at least one substitute reservation plan prepared by the substitute reservation plan preparation element, to the users, a second acceptance element adapted to accept the users' selection of the at least one substitute reservation plan, and a reservation element adapted to accept as reservation the substitute reservation plan whose selection is accepted by the second selection acceptance element.

According to the service reservation system, a substitute reservation plan is prepared which enables a general resource utilization efficiency to increase in accordance with the load

lev 1 of resources used for the supplying of the object services of the reservation booking requests and the contents of the reservation requested by the users, and the utilization of the services according to the substitute reservation plan is recommended to the users, whereby it becomes possible to induce the users to make reservation of the services according to the substitute reservation plan and thereby increase the resource utilization efficiency. When this substitute reservation plan in this system is prepared so that the plan has parts in which much consideration is given to the contents of reservation requested by the users, in accordance with the contents concerned, the degree of users' satisfaction can be secured to a certain extent.

Therefore, according to the present invention, the reservation of services in which the resource utilization efficiency and the degree of users' satisfaction concerning the utilization of the services are optimized can be attained.

BRIEF DESCRIPTION OF THE DRAWINGS:

Preferred embodiments of the present invention will be described in detail on the basis of the following figures, wherein:

Fig.1 is a block diagram showing the configuration of an embodiment of the service supply system according to the present invention;

Fig.10 is a diagram showing an initial screen for the

Fig. 19 is a flow chart showing a procedure of a processing operation of a service reservation unit in a tentative service reservation sequence in the embodiment of the present invention;

Fig. 21 is a flow chart showing a procedure of a processing operation of the service resources allotment management computer in the service reservation sequence in the embodiment of the present invention;

Fig.22 is a diagram showing a processing sequence of each part in a service execution control operation in the embodiment of the present invention;

Fig.24 is a flow chart showing a procedure of a processing operation of a service execution control unit in a service execution control sequence in the embodiment of the present invention;

Fig.25 is a flow chart showing a procedure of a processing operation of a service execution management computer in the

service execution control sequence in the embodiment of the present invention; and

Fig.26 is a flow chart showing a procedure of a processing operation of the service resources allotment management computer in the service execution control sequence in the
5 embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS:

An embodiment of the present invention will now be
10 described.

Fig.1 shows the configuration of an embodiment of the service supply system according to the present invention.

As shown in the figure, the service supply system of this
15 embodiment has a high function network 100, end users' computers 1 utilizing the service supplied by the high function network 100, a management computer group 300 adapted to manage and process various kinds of condition concerning the supplying of services, and a service supply management computer 2 adapted to control the reservation and execution of services.

20 The management computer group 300 includes a service reservation management computer 3, a service execution management computer 4, a users' attributes management computer 5, a condition management computer 6, service resources allotment management computers 7, data accumulation resources
25 management computers 8, data transmission resources management

computers 9, and data processing resources management computers
10.

The high function network 100 has network units 12, data accumulation computers 11, and data processing computers 13.

The service supply management computer 2 has a request for service analysis unit 201, a service type management unit 202, service reservation units 203, and service execution control units 204.

Each part of the high function network 100 will now be
10 described.

Each network unit 12 is adapted to supply transmission and exchange services to the end users' computers 1. To be exact, an ATM net, an ISDN net, an analog telephone net, a portable telephone net, a private line net, a frame relay net, an IP net, an SDH net, a satellite communication net, a CATV net, or a combination thereof corresponds to the network unit 12.

Fig. 2 shows an example of the configuration of the service supply system of Fig. 1 in a case where the network unit 12 is formed of plural transmission and exchange networks 1-n connected with each other.

Referring to Fig.2, the end users' computers 1 are connected to a single or plural transmission and exchange networks. The end users' computers 1 can suitably use an arbitrary transmission and exchange network connected thereto.

25 In the example of Fig.2, each computer in the management computer

group 300, service supply management computer 2 and end users' computers 1 are connected together via the transmission and exchange network constituting the network unit 12, whereby the service supply management computer 2 and end users' computers 1; the service supply management computer 2 and each computer in the management computer group 300; and the computers in the management computer group 300 are set communicatable with each other via the network unit 12. The communication between these parts may also be rendered possible not via the network units 12 in the high function network 100 but via other transmission and exchange network. Fig.2 shows an example in which the function of each computer in the management computer group 300 shown in Fig.1 is attained by distributed processing of the plural computers shown by the same reference numerals. The functions of these computers may also be attained by concentrated processing of a single computer.

The resources for the high function network 100 used for a service supplying operation of such network units 12 constitute, for example, transmission power, such as a transmission capacity of the network units 12.

The data accumulation computer 11 is adapted to accumulate data temporarily or permanently, and supply the service for distributing the accumulated data by utilizing the transmission and exchange service supplied by the network units 12 to the end user computers 1. To be exact, an electronic mail server,

a WWW proxy server, a cash server for domain name service, or a video cash server for distributing an image, which is sent by a user and temporarily stored, in accordance with a request made by a user correspond to the data accumulation computer 11.

Resources for the high function network 100 used for the supplying of services by the data accumulation computer 11 include resources for the accumulation capacity, transfer capacity and simultaneous distribution capacity of the data accumulation computer 11, and resources used for service supplying operations of the network units 12.

The data processing computer 13 is a computer having a data processing function. To be exact, the data processing computer 13 is an apparatus for carrying out the contraction and expansion of a video, synthesis of plural images, synthesis of plural voices, superposition of letters on an image, conversion of the color of an image, and encoding and decoding of an image. For example, a television meeting bridge which attains a multi-point television meeting by carrying out the synthesis of plural images and plural voices corresponds to this apparatus.

Resources for the high function network 100 used for the supplying of service by the data processing computer 13 constitute both the resources for transfer capacity and processing capacity of the data processing computer 13, and

resources used for service supplying operations of the network unit 12.

Each part of the management computer group 300 will now be described.

5 The users' attributes management computer 5 is adapted to hold attributes of end users and end users' computers 1.

10 The condition management computer 6 is adapted to manage, concerning every service, an actual reservation condition, and a load of logical resources for the high function network 100 in the actual reservation condition, i.e. a load of logical resources at each point in time for the high function network 100 in a case where the supplying of services is executed in accordance with the contents of the reservation.

15 The data accumulation resources management computers 8 are adapted to manage a condition of use of resources of the data accumulation computers 11 which will be described later.

 The data transmission and resources management computers 9 are adapted to manage a condition of use of resources of the network units 12 which will be described later.

20 The data processing resources management computers 10 are adapted to manage a condition of use of resources for the data processing computers 13 which will be described later.

25 The service resources allotment management computers 7 are adapted to allot services to be reserved or executed to respective resources of the high function network 100.

The service reservation management computer 3 is adapted to determine whether requested reservation is acceptable or denied while utilizing the service resources allotment management computers 7, and present a substitute plan which will be described later.

The service execution management computer 4 is adapted to determine whether execution of requested services is acceptable or denied while utilizing the service resources allotment management computers 7.

10 Each part of the service supply management computer 2
will now be described.

The service reservation units 203 are provided correspondingly to the kinds of services supplied by the high function network 100, and adapted to process requests for reservation received from the end users' computers 1 while utilizing the service reservation management computer 3.

The service execution control units 204 are provided correspondingly to the kinds of services supplied by the high function network 100, and adapted to process the requests for the execution of the services received from the end users' computers 1 while utilizing the service execution management computer 4.

25 The service request analysis unit 201 is adapted to analyze contents of reservation of servicers and those of requests for execution of the services received from the end users' computers

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The service type management unit 202 is adapted to manage services supplied by the high function network 100, logical levels of resources used for each service type, and the operations of the service reservation units 203 and service execution control units 204 which correspond to the kinds of services.

In that configuration, a hardware structure of each of these computers can employ a structure of a general computer 14 having a CPU 1401, a memory 1402, a storage 1403, a network interface 1404 and a bus 1405 which are shown, for example, in Fig.3. In this structure, a program 14021 and data 14022 supplied via a removable storage medium or network are stored in the memory 1402. When the CPU 1401 executes the program 14021, the processing of each part of each of the computers which will be described below is attained while the data 14022 are utilized.

An operation of the service supply system will now be described.

The operations of the service supply system of this embodiment are divided into three, i.e. a reservation service selection receiving operation, a service reservation operation and a reservation service execution control operation.

First, the reservation service selection receiving operation will be described.

Fig.4 shows a processing sequence of each part in the reservation service selection receiving operation.

As shown in the figure, the reservation service selection receiving operation is attained by a service synopsis supplying sequence and a service selection receiving sequence.

First, the service synopsis supplying sequence will be described.

Fig.5 shows a procedure of a processing operation of the request for service analysis unit 201 in the service synopsis supplying sequence.

In order to make a booking of services with reference to Fig.4, the end users' computers 1 transmit a request for synopsis of service to the request for service analysis unit 201 of the service supply management computer 2 (2001). The request for service analysis unit 201 transfers the requests to the users' attribute management computer 5 (2002) (Step 2301 of Fig.5).

The users' attribute management computer 5 holds a users' attribute table 5001 shown in Fig.6. As shown in the figure, on the users' attribute table 5001, information which includes a users' discriminator 5002 peculiar to the user, a users' name 5003, membership type 5004 representative of users type, a service discriminator 5005 representative of the services which the user subscribes, and network connection information 5006 indicating a position (address etc.) of the end user computers

1 on a transmission and exchange network attained by the network units 12 is registered as user's attributes for each of all users. For example, the user's name "Tom", the kind of membership "Personal, economy" and the service discriminator "103, 202, 212" are registered for the user having a user's identifier "1003".

The users' attributes management computer 5, upon receipt of the request for synopsis of service, reads out from the users' attribute table 5001 the service discriminator and the kind of membership both of which are corresponding to the user's discriminator of the user who made the request, to deliver them to the request for service analysis unit 201 (2003). For example, the service discriminator "103, 202, 212" and the membership type "Personal, economy" are delivered to the request for service analysis unit 201 concerning the user having the user identifier "1003".

The request for service analysis unit 201 transmits a request for the name of service, which corresponds to the service discriminator delivered thereto by the users' attributes management computer 5 to the service type management unit 202 (2004, 2005)(Step 2302 of Fig.5).

The service type management unit 202 holds a service attributes table 5101 shown in Fig.7. As shown in the figure, on the service attributes table 5101 which includes service identifier 5102, service name 5103, which includes service

203 and service execution control units 204 which correspond to the service, is registered, as service attributes, for each of all services supplied by the high function network 100.

computer 13 and each data accumulation computer 11 are managed as a unit of physical resources. A group of physical resources for supplying the same service types is managed as a unit of logical resources. Concerning the network units 12, transmission capacity and transmission quality used to supply one service type are managed as logical resources, and individual transmission and exchange network forming a network unit 12 is managed as a unit of physical resources.

20 respect to the service discriminator is delivered from the
request for service analysis unit 201 to deliver them to the
request for service analysis unit 201. For example, with
respect to the service discriminator "103, 202, 212" user
identifier "1003", the service names "Multi-point television
25 meeting economy, Newly produced motion picture low-price

previewing service, and Low-price service for viewing a real compilation of the newly produced motion picture" are delivered to the request for service analysis unit 201.

On the basis of the service name and the membership type,
5 the request for service analysis unit 201 determines contents of reservation which is acceptable for the user who made the request for synopsis of service(2006)(Step 2303 of Fig.5). In this step, for example, time zone of utilization of each service are limited for each membership type, whereby only the requests
10 for reservation for the limited time zone of utilization are rendered acceptable. To be exact, with respect to the user having the user identifier "1003" and the membership type "Personal economy", the service utilization time zone of the reservation for the low-price service for viewing a real
15 compilation of a newly produced motion picture is limited to 03:00-18:00. What to be used as users' attributes and service attributes and how to determine with respect to the users the acceptable contents of reservation on the basis of these users' and service attributes may be set arbitrarily in accordance
20 with the environment of the service supply system and services to be supplied and the uses thereof.

The request for service analysis unit 201 forms a synopsis of the names of the determined services(Step 2304 of Fig.5), and returns the synopsis to the end users' computers
25 1 (2007). The end users' computers 1 display as shown in. for

example, Fig.8 a synopsis of services whose reservation are acceptable services on a screen 5201, and thereby notify the users of the synopsis.

The above is a description of the service synopsis
5 supplying sequence.

The service selection receiving sequence will now be described.

Fig.9 shows a procedure of a processing operation of the request for service analysis unit 201 in the service selection
10 receiving sequence.

Referring to Fig.4, when something in the synopsis of service obtained in the service synopsis supplying sequence is designated by the user, the end user's computer 1 transmits a request for starting of a reservation making operation for
15 the designated service to the request for the request for service analysis unit 201 (2008).

In response to this request for service analysis unit 201 obtains information on the service reservation unit 203 corresponding to the designated service, from the service type
20 management unit 202 (2009,2010) (Step 2401 of Fig.9). The service reservation unit 203 specified by the information thus obtained is started (2011)(Step 2402 of Fig.9), and then initialized (2012)(Step 2403 of Fig.9).

The initialized service reservation unit 203 forms such
25 an initial screen 5301 for service reservation as shown in,

A procedure for processing of the service reservation unit 203, a service reservation management computer 3 and the service resources allotment management computers 7 in the tentative service reservation making sequence will be shown in Figs.12, 13 and 14 respectively.

Referring to Fig.11, the end user computer 1 receives desired service starting and finishing time, and discriminators of participants it the service to be reserved is a television meeting from the users via the initial screen 5301 for service reservation as shown in Fig.10, and send them to the service reservation unit 203 (2101).

In response to this (Step 2501 of Fig.12), the service reservation unit 203 sends this received information (2102)(Step 2502 of Fig.12), service attributes obtained from the service type management unit 202 and registered on the service attribute information table 5101 for the service which reservation is requested, and a physical connection information evaluation equation which is determined in accordance with predetermined conditions, and which will be described later, to the service reservation management computer 3.

In response to this, the service reservation management computer 3 obtains the users' attributes (persons to participate in the meeting in a case where the desired service is to hold a television meeting) who are demanding service reservation

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preparation of the substitute plan is necessary, prepares the substitute reservation plan and its logical connection information (2107)(Step 2604 of Fig.13).

5 The substitute reservation plan is prepared by altering a part of the logical resources of the high function network, which is indicated by variables of the logical connection information, i.e. service starting and finishing date and time and logical resources information, in accordance with service execution policies prepared in advance.

10 ~~Examples of the service execution policies are shown in Fig.15.~~

15 The service execution policies shown in Fig.15 are applied to a case where the logical resource information included in the logical connection information for the reservation uses logical resources of TVconfBridge3. When the loads of the service starting and finishing date and time for the TVconfBridge3 are not lower than 95%, not lower than 80%, not lower than 50% and lower than 50% respectively, a judgement as to whether or not the reservation is accepted, and as to whether or not the substitute plan is presented, and a method of calculating the substitute plan are prescribed in accordance with the membership type of the participants.

20 As shown in the figure, the service execution policies are expressed by groups of if-then rules. The "if conditions" are examined in order from the upper side, and, when there are

any "if conditions" whose results become real, their rules are applied, and the process described after "then" are carried out. In this case, the rules shown on the lower side of the applied rule are not applied irrespective of the results thereof.

5 When a person having the highest level of the membership type among the participants is a member of "individual general", and a load of the TVconfBridge3 for a desired reservation time zone is at 85%, the rule 2625 is applied. This rule indicates to search for a time zone of a load of lower than 80% in a period
10 of time between the time four hours before the requested time zone and that four hours after the same requested time zone without denying requested reservation, and indicates that a substitute reservation plan, in which reservation service starting and finishing date and time of the requested reservation
15 are changed to be held in the discovered time zone, should be prepared.

 When a person having the highest level of the membership type among the participants is a member of "individual economy" and a load of the TvconfBridge3 for a desired reservation time
20 zone is at 85%, the rule 2626 is applied. This rule indicates to search for a time zone of a load of lower than 80% in a period of time between the time four hours before the requested time zone and that four hours after the same requested time zone after denying requested reservation, and indicates that a
25 substitute reservation plan, in which reservation service

starting and finishing date and time of the requested reservation are changed to be held in the discovered time zone, should be prepared.

In this embodiment, the levels of the membership type become higher in the order of "individual economy", "individual general" and "corporation" ("corporation" is the highest). A request for reservation from a person having the membership type of "corporation" has a degree of importance higher than that of a request for reservation from a person having the membership type of "individual general", and a request for reservation from a person having the membership type of "individual general" has a degree of importance higher than that of a request for reservation from a person having the membership type of "individual economy".

The logical connection information on the substitute reservation plan includes user discriminators for all the persons that participate in the services by the substitute reservation plan, logical resource information representative of logical resources for the high function network 100 used in the services, service starting and finishing data and time and a physical connection information evaluation equation. In the case of the rule 2625 of Fig.15, user discriminators of all the participants, logical resource information and a physical connection information evaluation equation become identical with those of the logical connection information on

The requested reservation and the substitute reservation plan prepared on the basis of the results of the execution of the above-described processes will hereinafter be called reservation candidate. When the substitute reservation plan is not prepared, the requested reservation only becomes the candidate reservation.

15 ~~When the service resources allotment management computer~~
7 receives this request (Step 2701 of Fig.14), the computer 7
~~makes a service resources allotment plan.~~

First, the service resources allotment management
computer 7 inquire from the users' attributes management
25 computer 5 about the network connection information

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corresponding to the users' discriminators of all the participants indicated by the logical connection information registered on the users' attributes table 5001 to obtain the network connection information, said information is obtained
5 (Step 2702 of Fig. 14).

Then the service resources allotment management computer 7 selects all groups of physical resources corresponding to the logical resources indicated by the logical resources information of the logical connection information are selected
10 by using a data accumulation resources management table 2650 and a data processing resources management table 2660 which are held in advance, and the network connection information corresponding to the users' discriminators of all the participants indicated by the previously obtained logical
15 connection information (Step 2703 of Fig. 14).

Fig. 16 shows an example of the data accumulation resources management table 2650. This data accumulation resources management table 2650 is provided on the assumption that the data accumulation computers 11 are used as video cash servers.
20 Concerning every physical resource, logical resource 5402 to which the physical resource belongs, a physical resource discriminator 5403, a computer discriminator 5404 of the data accumulation computers 11 in which the physical resource is provided, and a total amount of the physical resource is
25 registered on the table 2650. In this example, a combination

of the number of acceptable reservation 5405, a maximum transfer speed 5406 and a maximum number of clients (number of the end users' computers 1 to which video data can be transmitted at once) 5407 are registered as a total amount of the physical resource.

Fig.17 shows an example of the data processing resources management table 2660. This data processing resources table 2660 is provided on the assumption that the data processing computers 13 are used as apparatuses for subjecting television meeting bridge or processing a superimposition on image data. Concerning every physical resource, logical resource 5502 to which the physical resource belongs, a physical resources discriminator 5503, a computer discriminator 5504 for the data processing computers 13 in which the physical resource is provided, and a total amount of the physical resources are registered on the table 2660. In this example, a combination of the number of acceptable reservation 5505, a maximum transfer speed 5506 and a maximum number of connection (number of end users' computers 1 capable of participating a television meeting at once) 5507 is registered as a total amount of the physical resources.

Each of the physical resources groups selected forms a group of one of the physical resources corresponding to the logical resources indicated by the logical resources information of the logical connection information registered

on the data accumulation resources management table 2650 and data processing resources management table 2660, and physical resources (i.e. transmission and exchange network or a combination thereof) for the network units 12 capable of forming one path, between the end users' computers 1 indicated by the one of the physical resources and the network connection information by transmission capacity and transmission quality indicated by the logical connection information.

After a group of physical resources has thus been selected,
10 physical connection information candidate is selected by using
a reservation management table 35 shown in Fig.18 (Step 2704
of Fig.14).

The reservation management table 35 is formed for each reservation set or temporarily set, so as to include a reservation number 5602, reservation type 5603, physical connection information 5604 and starting and finishing date and time 5605, 5606. In the reservation type 5603 in this example, either "real reservation" indicative of properly set reservation or "tentative reservation" indicative of tentatively set reservation is set. The physical connection information 5604 indicates physical resources used for reserved service and a using amount of the resources used for the service. The starting and finishing date and time 5605, 5606 represent the time at which the reserved service is executed.

25 Namely, in a Step 2704 of Fig.14, the following operation

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is carried out. As to the service for reservation candidate being processed, assumed that the service for the reservation registered as "real reservation" on the reservation management table 35 is executed in accordance with the starting and finishing date and time, set with respect to the reservation, during the time between the service starting and finishing time designated in the logical connection information by using a group of physical resources and a using resource amount indicated by the physical connection information set with respect to the mentioned reservation. In that case, all groups of physical resources in which the sum of resources required to execute each physical resource belonging to the group of the physical resources do not exceed the total amount of the physical resources when the group of the physical resources is executed by using the amount of resources written in the logical resources information in the logical connection information, are extracted. Each extracted group of physical resources is determined as physical connection information candidate in which the amount of resources written in the logical resources information is set as a using resource amount. With respect to this physical connection information candidate, the service starting and finishing data and time indicated by the logical connection information is set as starting and finishing date and time. A total amount of the physical resources for the transmission and exchange network is set as a total

transmission capacity of the transmission and exchange network.

When no physical connection information candidate could be prepared in this process, the service resources allotment management computer 7 informs a failure in the allotment of resources to the service reservation management computer 3 (2110). When physical connection information candidate could be prepared, the service resources allotment management computer 7 evaluates each physical connection information candidate in accordance with the physical connection information evaluation equation indicated by the logical connection information, and selects the highest-evaluated physical connection information candidate as physical connection information (Step 2705 of Fig.14). The physical connection information evaluation equation is, for example, an equation for increasing the evaluation value of the physical connection information in inverse portion to the cost of use.

Then the service resources allotment management computer 7 generates a reservation number to register (Step 2706 of Fig.14) on a reservation management table 35 shown in Fig.18 with the physical connection information selected in Step 2705 shown in Fig.14 and the starting and finishing date and time set with respect thereto. During this time, the reservation type is set to "tentative reservation".

Then the service resources allotment management computer 7 informs the stored reservation number to the service

reservation management computer 3 (Step 2707 of Fig.14). As a result, the reservation numbers registered with respect to respective reservation candidates are notified to the service reservation management computer 3.

5 After the service reservation management computer 3 receives reservation numbers with respect to the respective reservation candidate from the service resources allotment management computers 7, the computer 3 stores the reservation numbers and logical connection information on reservation
10 candidate, and notifies the service reservation units 203 of this fact (2113)(Step 2606 of Fig.13).

Consequently, the service reservation units 203 informs the reservation numbers and the logical connection information to the end users' computers 1 (2114)(Step 2503 of Fig.12).

15 The end users' computers 1 then display the received reservation numbers and logical connection information as a synopsis of reservation candidate.

The tentative service reservation making sequence have been described.

20 The real service reservation making sequence will now be described.

A procedure for processing operations of service reservation units 203, service reservation management computers 3 and service resources allotment management
25 computers 7 in the service reservation making sequence are shown

in Figs.19, 20 and 21.

Referring to Fig.11, the end user's computer 1 transmits the reservation number designated by the user out of the synopsis of reservation candidate obtained from the service reservation units 203 to the service reservation unit 203 to demand the making of real reservation therefrom (2115).

~~Consequently, the service reservation unit 203 transfers the received reservation number to the service reservation management computer 3 (2116)(Steps 2801 and 2802 of Fig.19).
10 The service reservation management computer 3 transfers the reservation number, whose real reservation was demanded, and the logical connection information stored in Step 2606 of Fig.13 corresponding to the reservation number to the service execution management computer 4 (2117)(Steps 2901 and 2902 of Fig.20).
15 The service execution management computer 4 stores the reservation number and the mentioned information.~~

~~Then the service reservation management computer 3 transfers the reservation number, whose real reservation was demanded, to the service resources allotment management computer 7, to demand the real reservation thereof (Step 2903 of Fig.20) and notify all reservation numbers stored in Step 2606 of Fig.13 except for the reservation number whose real reservation was demanded to the service resources allotment managing computers 7, to request for the cancellation of the reservation (2119 and 2120)(Step 2904 of Fig.20).~~

Consequently, the service resource allotment management computer 7 changes the reservation type having the reservation number whose real reservation was demanded to "real reservation" in the reservation management table 35 (Step 3002 of Fig. 21), and deletes from the reservation management table 34 the reservation (their reservation type is "tentative reservation" at this time) of reservation numbers whose cancellation was demanded (Step 3003 of Fig. 21).

The success in making real reservation is notified to the service reservation management computer 3 (2120) (Step 3004 of Fig.21).

Consequently, the service reservation management computer 3 notifies the service reservation units 203 that making real reservation has finished (2121), and sends (Step 2805 of Fig. 21) to the condition management computer 6 the reservation number and the logical connection information stored in Step 2606 shown in Fig. 13 corresponding to the reservation number of which the making of real reservation succeeded. The condition management computer 6 adds the reservation represented by the received logical connection information to the present reservation condition managed thereby. The condition management computer 6 calculates for every service on the basis of this reservation condition and a total amount of each logical resources for each service held in advance, the load of logical resources, at each point in time, for the

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~~high function network 100 in the present reservation condition,~~
1.e., in a case where the service is executed in accordance
~~with the reservation.~~

When the service indicated by the logical connection
5 information corresponding to the reservation number of which
the making of real reservation was succeeded is a telephone
meeting etc., the service reservation units 203 informs the
completion of the making of real reservation, with logical
connection information to each participant other than the users
10 who demanded the making of real reservation in the service (2122).
This enables each participant to ascertain that the service
in which he or she is to participate was reserved (Step 2804
of Fig.19). The completion of the reservation is notified to
the end user's computer 1 of the user who demanded the real
15 reservation (2123)(Step 2805 of Fig.19).

The real service reservation making sequence has been
described above.

The service execution control operation will now be
described.

20 Fig.22 shows a processing sequence of each part in a
service execution control operation.

As shown in the figure, the service execution control
operation is attained by a service execution control starting
sequence and a service execution control sequence.

25 First, the service execution control starting sequence

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~~The service execution management computer 4 receives~~
this request (Step 3301 of Fig.26), and transfers it to the
service resources allotment management computer 7 (2201)(Step
~~3302 of Fig.25)~~

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5 When the service execution allotment management computer
7 receives (Step 3401 of Fig.25), it takes out (Step 3402 of
Fig.26) the physical connection information on the reservation
corresponding to the reservation number concerning the request
from the reservation management table 35. Next, as to each
10 of the physical resources included in the physical connection
information, the service execution allotment management
computer 7 requests for allotment of resources of using resource
amount indicated by the physical connection information of the
physical resources to the data accumulation resources
15 management computer 8, the data transmission resources
management computer 9 and the data processing resources
management computer 10 which manage the physical resource
(2211)(Step 3403 of Fig.26).

20 The data accumulation resources management computer 8,
the data transmission resources management computer 9 and the
data processing resources management computer 10 notify
allotment success to the service resources allotment management
computer 7 when there is room whose volume corresponds to the
using resource amount requested, among the physical resource
25 which is requested for the allotment (2212).

The success in the starting of the service is notified with the received physical connection information to the end user's computer 1 which requested for the service (2216)(Step 25 3205 of Fig.24).

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As described above, in the this embodiment, a request for service having a degree of importance not higher than a level of importance which increases in proportion to a load of resources is denied even when reservation is accepted to execute the service in accordance with the reservation, and the amount of resources used for the service does not exceed a level utilizable for the service by a process using the service operating policies of Fig.15. When a request for reservation is thus denied, or, even when such a request is not denied, a substitute reservation plan capable of heightening the resources utilization efficiency is prepared, and presented to the users to accelerate the users' utilization of services based on the substitute reservation plan.

0 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99

Therefore, reservation of a high degree of importance can be accepted preferentially with a high probability. In addition, reservation of a low degree of importance once accepted is not cancelled later. Furthermore, when the utilization of the services based on a substitute reservation plan in which a part only of the contents of a user's desired reservation is changed, i.e., the contents of a user's desired reservation are respected to a predetermined extent is recommended to the users, whereby the users' reservation can be induced in the direction in which the utilization efficiency of resources increases.

Therefore, in the this embodiment, the utilization efficiency of resources and the degree of the users' satisfaction concerning the utilization of services can be optimized.

In this embodiment, as a substitute reservation plan, a case where the service starting and finishing time out of variables constituting the contents of reservation requested by a user is changed by using the service operating policies shown in Fig.15 is described. However, it may be determined arbitrarily in accordance with the environment and condition of the service supply system and the operator's policy what kind of variable among the variables constituting the contents of reservation should be changed to prepare a substitute reservation plan to be presented. The variables out of variables constituting the contents of the reservation

Although the resources are managed in two stages, i.e., in stages of logical resources and physical resources in this embodiment, the managing of the resources may also be done in one stage only. In both of these cases, the unit of the resources

to be managed may be an arbitrary unit related to the service.

The techniques in this embodiment for denying reservation in accordance with the load of resources and the degree of importance of the reservation, and presenting a substitute plan
5 can be applied in the same manner to an arbitrary system for supplying service by using certain resources besides the high function network shown in this embodiment.

According to the present invention described above, the rate of utilization of resources and the degree of users' satisfaction concerning the utilization of services can be
10 optimized. To be exact, for example, the services which do not cause the degree of users' satisfaction concerning the utilization thereof to lower greatly with a considerably high efficiency of utilization of resources maintained can be
15 supplied. Also, the smoothing of the users' utilization of the services can be done as services with which the users are satisfied to a certain extent are supplied.